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ABSTRACT

Vocational education was largely established on the principle of nontransferability. However, vocational education and academic education have many similarities. Indeed, the difference between basic and academic skills has often been defined in terms of rigor. Basic skills are those concrete skills that are generally taught at the elementary level, whereas academic skills are those that require an understanding of laws, principles, and phenomena. If most people learn best by moving from the concrete to the abstract, then a society that promotes compulsory education must acknowledge the value of vocational education as a method of educating students in concrete knowledge that can extend as far as possible into abstract thought. Vocationalism often reinforces academic concepts, and in some instances, vocational educators teach academics (especially basic skills) in order to teach a vocational skill. Studies indicate that little collaboration exists between vocational and academic teachers. In view of the technological and information booms that are underway and increasing skills demands placed on entry workers, vocational and academic teachers must increase their understanding of what each other teaches, with vocational teachers assuming the role of a reinforcer who acknowledges and respects the value of other subject areas. (MN)

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INTERPRETING VOCATIONALISM AS APPLIED ACADEMICS

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Abstract

Vocational education and academic education have many similarities. Vocationalism often reinforces academic concepts, and in some instances, vocational educators teach academic concepts to teach a vocational skill. This paper describes the possibility of developing vocational education into curriculum which deliberately integrates vocational education and academic education.

INTERPRETING VOCATIONALISM AS APPLIED ACADEMICS

> The worst thing about empiricism in every department of human activity is that it leads to a blind observance of rule and routine. The mark of the scientific worker is that he has power in grappling with the new and the untried; he is master of principles which he can effectively apply under novel conditions. The one is slave of the past, the other is a director of the future.
>
> John Dewey, 1895

The National Commission on Excellence in Education's report A Nation At Risk: The Imperative for Educational Reform (1983) defined the problems "affecting American education" and suggested possible solutions. The report swept across the nation indicting American educational institutions with both "unthinking, unilateral educational disarmament" and with a recurring and pervasive "rising tide of mediocrity" (p.5). The most significant recommendation emerging from the report was the recommendation for marked increases in academic credits required to earn a high school diploma. Increasing academic requirements for required course work subsequently have diminished the amount of time available in students' schedules for vocational education thus promoting questions about how can vocational education fit into a quality education

The National Commission in Secondary Vocational Education rebutted the initial report with The Unfinished Agenda: The Role of Vocational Education in the High School (1984) by arguing the appropriateness of vocational education being offered at the secondary level. Zalman Usiskin (1987) recently noted that high school graduates are not learning enough mathematics and "motivation in project courses often come from real-world applications of mathematics" (p. 31). The National Commission called for a "joint effort between the academic teachers and vocational teacher" (p. 14). It has been argued

that vocational education has the potential for becoming the motivating force or the "occasion" for academic education if the relationships have been clearly established and articulated.

Pennsylvania's Regulations and Standards for Vocational Education (1986) states "that where necessary to promote the educational program, up to three planned vocational courses may be substituted for the required graduation units of credit set forth in Chapter 5" (p. 14). The school district must, however, verify relationships existing between the vocational programs and the academic courses. This task has not been done sufficiently because thorough analysis has not been conducted. Other states are pursuing the same type of analysis; however, the task is not complete. In fact, the question is not completely clearly defined. Several questions pervade the inquiry:

-- What are basic skills and how do they differ from secondary academic skills?

-- Are knowledge bases transferrable from one content area to other content areas?

-- Who is qualified to teach academic content in a vocational curriculum?

Computerized Curriculum

Since vocational programs have been developed around local curricula, it has been difficult to create generic exemptions between vocational programs and academic programs. The Williams' Computerized Vocational Curriculum System (1986) promotes computerized curriculum development whereby allowing local curriculum to be built from data which have been validated through statewide technical committees and constructed from task analyzed V-TECS data. This type of analysis organizes and documents vocational content and provides a format to relate vocational content to academic content.

Vocational educators and academic educators are responsible for creating total curriculums that lead to high school diplomas for millions of students. Because employers

have resoundingly expressed the value of academic education and because educational researchers have demonstrated the value of teaching complex concepts in an applied context, vocational education can be a method for teaching or reinforcing many academic concepts (Swayer, 1986) while at the same time providing job entry level skills. The applied context, in some instances, motivates students to learn more complex concepts. Furthermore, academic skills have been the skills which allow transferability of knowledge from one occupation to another. When vocational subject matter has been taught in view of academic laws and principles, the foundation for learning new information or new job skills gives vocational education students greater potential for learning new information. For example, Phythagorean's Theorum has important applications for the carpentry student who is attempting to layout a roof rafter. This type of learning promotes life-long learning and the ability to move from one occupation or assignment to another with less training. Instead of focusing on obsolete skill development, vocational education must emphasize knowledge and skills which are firmly founded on transferable knowledge and skills based on laws, principles, and processes for problem solving.

Relating Academics to Vocationalism

Vocational education, as applied academics, requires thoughtful and deliberate analysis of learning hierarchies or taxonomies of learning and relating that academic knowledge to specific vocational content. This notion requires the coordination between academic educators and vocational educators to study the specific relationships. Herein lies the problem. Vast amounts of technical knowledge must be related to specific academic information which goes beyond basic skills. Relating laws and principles to vocational competencies must be accomplished by utilizing tools such as interactive video discs, CD-ROM, simulation software, computer-based science laboratories in order to increase the

scope and depth of any vocational programming ultimating enhancing all vocational programs. More importantly, the tools must be utilized with vocational and academic teachers collaborating to understand the similarities of content.

A computer-based matrix of vocational competencies, science competencies, phenomena, laws, and principles was developed to illustrate specific relationships among the different competencies. See Figure 1. This matrix served as a point of reference for vocational teachers and academic teachers to articulate the possibilities for coordinating the times to schedule topics. The emphasis being on the academic teachers taking the lead in teaching concepts while vocational teachers apply the concepts in vocational laboratory to reinforcing the academic knowledge.

Our preliminary investigation of existing collaborative teaching between vocational & academic teachers indicates there has been little. Furthermore, when efforts have been attempted to integrate academic and vocational curricula, articulation has been difficult because of time and lack of documentation.

The time issue related to the problem of academic teachers teaching information prior to or after the vocational teacher was teaching a related concept. Also, neither vocational or academic teachers have been aware of specific content taught in one anothers' classes. Needless to say, there has been little time scheduled to allow vocational and academic teachers to develop strong partnership.

Perhaps the most obvious omission has been the lack of specific documentation of competencies taught in either academic or vocational content areas. While information is abundant, it has not been organized in a way which has easily allowed specific relationship to be articulated.

Conclusions

Because technology is becoming increasingly pervasive, vocational educators must remember that teachers do the teaching and the tools of technology provide opportunities for learning (Mojkowski, C., 1987). Technology cannot be allowed to be a substitute for human endeavor. John Dewey suggested that we not be slaves to the past. I suggest that we not be slaves to future technology, but that we carefully organize and document knowledge and identify appropriate methodologies to maximize learning. Technology can provide opportunities to organize and document vast amounts of information and pedagogy can be translated and utilized to educate.

Serious questions have emerged about whether vocational teachers are certified to teach subject matter requiring certification in physics, chemistry, biology, etc. Ask a science teacher who has been furloughed because of low enrollments if a vocational teacher should be allowed to teach physics content which can be counted toward graduation requirements? Or, ask a science teacher who has invested many years in becoming a certified science teacher if a vocational teacher, who comes directly from industry with no college experience has been adequately prepared to teach a class which counts toward a vocational credit and a physics credit?

The wholehearted pursuit of linking academic education with vocationalism must be found in articulation and partnerships between academic teachers and vocational teachers. The partnerships must be founded on a mutual commitment to provide the best possible curriculum for all students. Oakes (1986) stated that we must stop tinkering with vocational education and begin reconstructing vocational education. Emphasizing vocational education as applied academics is not a tinkering matter, it is a matter of reconstructing education.

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Unit Number: 360
Unit Title: APPLYING ANIMAL SCIENCE PRINCIPLES - NUTRITION

Ag Competency	Science Competency	Phenomena/Laws/Principles
1 Identifying feedstuffs corn wheat barley soybean meal cotton seed meal	*20600(4)* Discuss the need to care for, respect, and protect living things *20600(6)* Explain why biology is a dynamic science which will impact on their lives in the future as a result of revolutionary advances in medicine, agriculture, and industry.	Theory Supply/Demand/Food Chain Theory Supply/Demand/Food Chain
2 Listing nutrients supplied by various feeds	*20300(1)* Describe and illustrate the transfer of energy as it moves through a series of organisms (food chain) starting at the source and ending at the final disposal into the non-living environment. Use various types of habitats such as: (a) a temperate prairie; (b) a fresh water lake; (c) a tundra; (d) any other suitable habitat. *20300(2)* Relate the benefits each of the following groups of organisms give to their communities as they perform the functions by which they maintain themselves: (a) producers; (b) consumers-primary and secondary; (c) decomposers.	Solubility/Metabolism/Macronutrients/Calorie Values/Food Chain Macronutrients/Vitamins/Minerals Decomposition
3 Listing functions of nutrients mg, selenium, carbohydrates, protein	*25600(10)* Produce static charges on various objects and explain how certain charged objects interact.	
4 Comparing methods of measuring feed energy	*20800(3)* Use measurements to calculate derived properties of matter such as density, rate, specific heat, etc. *20800(10)* Distinguish between temperature and heat.	Molecular kinetic theory Molecular kinetic theory

Figure One

Ag Competency		Science Competency	Phenomena/Laws/Principles
5	Identifying parts of ruminant digestive system	*20000(5)* Identify similarities and differences between photosynthesis and respiration and analyze these processes in terms of energy exchanges in living systems.	Fermentation/Hydralosis/ Extracellulary/Blending Theory/ Homeostasis/Respiration/ Photosynthesis
6	Identifying parts of monagastric digestive system	*20000(5)* Identify similarities and differences between photosynthesis and respiration and analyze these processes in terms of energy exchanges in living systems.	Blending Theory/Homeostasis
7	Sampling feedstufffs and reading test results	*20800(2)* Describe the origins and advantages of the SI system.	Molecular kinetic theory
		20800(3) Use measurements to calculate drived properties of matter such as density, rate, specific heat, etc.	Molecular kinetic theory
		20800(4) Observe objects, substances, or events by counting, comparing, estimating and measuring.	Molecular kinetic theory
8	Determining nutrient amounts required by animals	*20800(6)* From a set of data provided, select those which support a given inference.	Molecular kinetic theory
		20800(7) Describe 'uncertainty' of calculated results which are based upon measurements.	Molecular kinetic theory
9	Calculating nutrient amounts furnished by forages	*20800(5)* Express measurements and calculated results to the correct number of significant digits.	Molecular kinetic theory

Figure One

Ag Competency		Science Competency	Phenomena/Laws/Principles
10	Determining concentrate amounts needed by livestock	*20800(5)* Express measurements and calculated results to the correct number of significant digits.	Molecular kinetic theory
		20800(6) From a set of data provided, select those which support a given inference.	Molecular kinetic theory
		20600(5) Use contemporary examples to illustrate the need for conservation, preservation, and wise use of natural resources.	Theory of Supply/Demand
11	Formulating concentrate mixes	*20600(5)* Use contemporary examples to illustrate the need for conservation, preservation, and wise use of natural resources.	
		20600(2) Propose solutions to social problems that result from the use of science and technology, using an informed decision making model.	Theory of Supply/Demand

Figure One